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**West Springfield/Springfield  
Massachusetts**

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# **SUPPLEMENT REPORT TO MAY 1982 DETAILED PROJECT REPORT**

**SEPTEMBER 1982**



**US Army Corps  
of Engineers**  
New England Division

SUPPLEMENT REPORT  
TO MAY 1982  
DETAILED PROJECT REPORT ON  
WEST SPRINGFIELD/SPRINGFIELD, MASSACHUSETTS

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## INTRODUCTION

This supplement to the May 1982, West Springfield/Springfield Detailed Project Report has been developed to address comments raised by the Office of the Chief of Engineers (OCE) during their review and to modify the original report by removing the proposed project in Springfield from the recommendations. Comments center on two major issues, the logic behind raising flood-wall sections of the West Springfield Project 1 foot and the amount of "lead time" provided by the proposed automated flood forecasting system. Other related comments have been addressed as necessary.

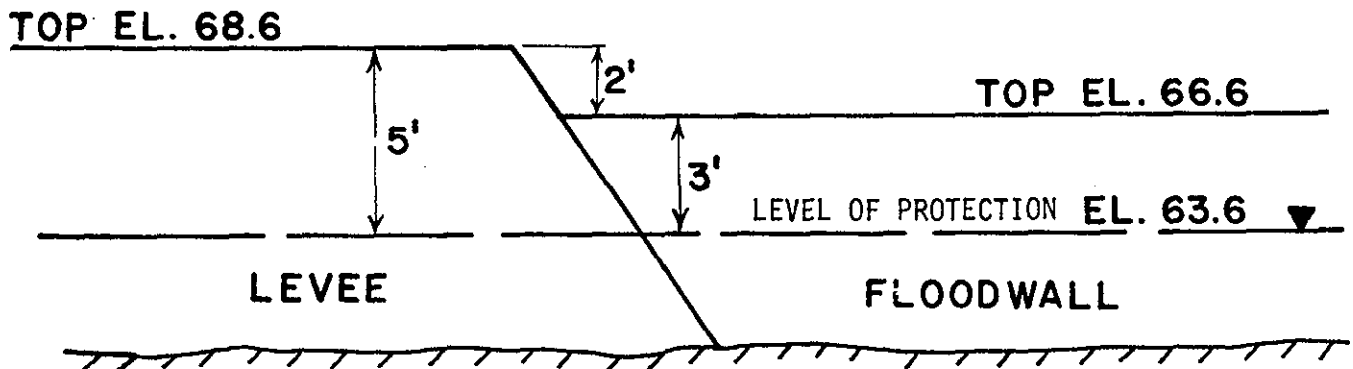
The West Springfield/Springfield Detailed Project Report submitted to OCE included a recommendation that an automated flood forecasting system be installed in the city of Springfield. This recommendation was based on phone conversations with Springfield officials who indicated that a letter supporting the proposed flood forecasting system would be forthcoming. The city of Springfield has yet to respond to our requests. Their silence indicates a lack of interest in the proposed flood forecasting system and it has been decided to eliminate the city from participation in the proposed project. A revised recommendation is contained at the end of this supplement.

### MODIFICATION OF THE WEST SPRINGFIELD LOCAL PROTECTION PROJECT

#### ORIGINAL PROJECT DESIGN

The West Springfield Local Protection Project, completed in 1953, was designed to protect against a modified Connecticut River flow of 246,000 cfs, as measured at the Thompsonville U.S.G.S. gage. This flow would produce a design flood stage of 63.6 feet NGVD at Memorial Bridge. A uniform freeboard of 3 feet for both concrete walls and levees was originally proposed for the West Springfield Project. However, because the upstream reservoir plan would not be completely effective for some time, the Board of Engineers for Rivers and Harbors recommended that levee sections be designed with an additional 2 feet of freeboard. The adopted design freeboard was 5 feet for levees and 3 feet for concrete walls (see Figure 1).

FIGURE 1



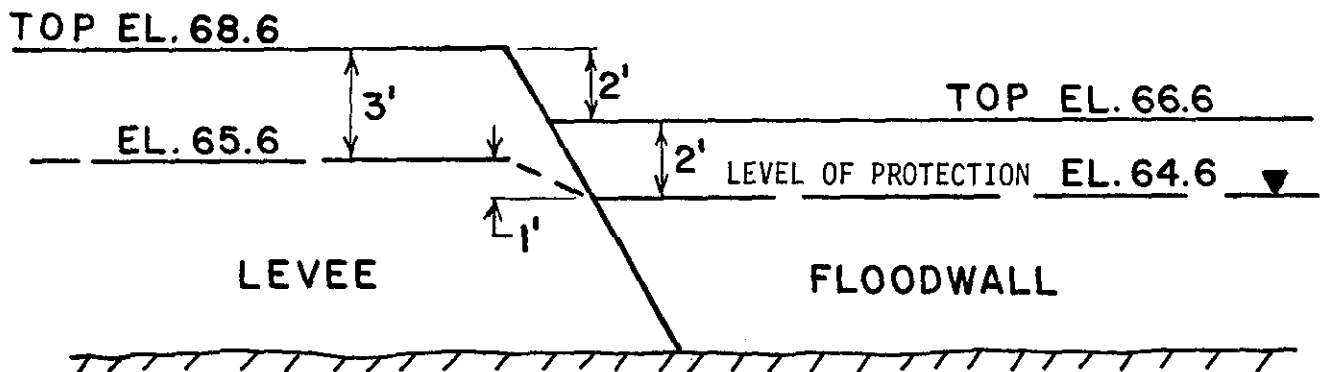
ORIGINAL FREEBOARD DESIGN

## PRESENT FREEBOARD CRITERIA

As part of our investigation, we studied various methods of modifying the existing West Springfield Project to provide additional flood protection. Our hydraulic analysis determined that 2 feet of freeboard for floodwalls and 3 feet for levees is sufficient for the West Springfield Project. This current design freeboard is consistent with that used at other Corps projects constructed in urban areas where overtopping would cause catastrophic losses. Freeboard is used to ensure that the desired degree of protection will not be reduced by uncertainties in hydraulic computations, wave action, debris, and other unaccountable factors affecting water levels. Levees are designed with an additional foot of freeboard because they are more likely to fail structurally if overtopped.

By applying the current freeboard criteria and using Memorial Bridge as an example, the level of protection provided by floodwall and levee sections of the West Springfield Project would be 64.6 and 65.6 feet NGVD, respectively, as shown in Figure 2. These values were obtained by subtracting 2 feet of freeboard from the top of existing floodwalls and 3 feet of freeboard from the top of existing levees. Levee portions of the project provide 1 foot of additional protection above that provided by the floodwalls. Therefore, the level of protection provided by the West Springfield Project is limited by the height of existing floodwalls.

FIGURE 2



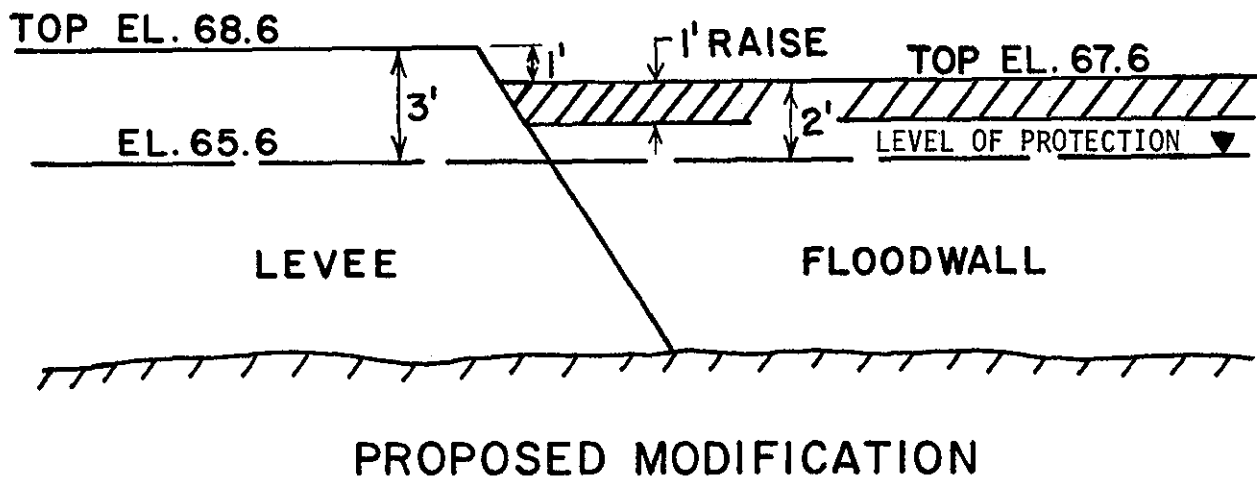
## PRESENT FREEBOARD CRITERIA

### PROPOSED MODIFICATION PLAN

To provide the highly urbanized area behind the West Springfield Project with additional protection and to comply with current freeboard criteria, we developed a plan to increase the height of just the floodwall portions of the project by approximately 1 foot, as shown in Figure 2. During prep-

aration of plans and specifications, the total height increase may vary slightly depending on variations in the original design of the project. Floodwall sections would then provide the same level of protection as levee sections, allowing the entire project to provide a uniform level of protection that is 1 foot higher than currently exists.

**FIGURE 3**



Sections of concrete floodwall to be raised total 3,425 feet and are outlined below.

1. Raise the existing concrete floodwall 1 foot in Reach 1 from station -1+50 to station 21+50, a total of 2,300 feet.
2. Raise the existing concrete floodwall 1 foot in Reach 2 from station 35+76.31 to station 40+56.31, a total of 480 feet.
3. Raise the existing concrete floodwall 1 foot in Reach 2 from station 55+14.92 to station 59+09, a total of 394 feet.
4. Raise the existing concrete floodwall 1 foot in Reach 2 from station 59+65 to station 62+16, a total of 251 feet.

The West Springfield and Springfield Projects are located on opposite banks of the Connecticut River and provided these communities with essentially the same level of flood protection. Raising floodwall sections of the West Springfield Project 1 foot, to prevent inundation of areas protected by this flood control system, would not induce additional measurable damages behind the

Springfield Project. During flooding, the large discharge capacity and slow response time of the Connecticut River are such that the storage area behind the West Springfield Project would not attenuate flood stages. See Plates 1 and 2 for the SPF hydrograph for the Connecticut River at Thompsonville, Connecticut and the corresponding stream profile along West Springfield.

## AUTOMATED FLOOD FORECASTING SYSTEM, WEST SPRINGFIELD

### EXISTING CONDITIONS

The Connecticut River can be expected to peak at West Springfield approximately 36 hours or longer after rainfall begins in the upper watershed. This allows time for the National Weather Service (NWS) in Bloomfield, Connecticut to monitor the river and provide local communities with forecasts of potential flooding. Hydrologic information is gathered by the NWS at least once daily and up to four times a day during heavy rain/flood situations. This information is then compiled in a central computer, and forecasts are computed and relayed to the public. Flood forecasts are made available to local communities through teletype networks, telephones and radio. The town of West Springfield receives these forecasts from the NWS and can expect about 12 hours of lead time before flooding occurs along the Connecticut River.

The Westfield River can be expected to peak at West Springfield about 6 hours after rainfall begins in the upper watershed. The NWS does not monitor this river because of its relatively quick response time. The town of West Springfield must rely on information obtained from upstream communities or local weather forecasts. Experience has shown that the town has 2 hours or less of lead time and has no way of predicting the extent of flooding along the Westfield River.

### PROPOSED FLOOD FORECASTING SYSTEM

The NWS has developed a system that uses a microcomputer to transmit data and messages between it and the central computer. The microcomputer may then obtain collected gage data and other pertinent information about the Connecticut River from the central computer in Bloomfield, Connecticut and generate potential flood stages. This would allow the town of West Springfield to obtain forecasts directly. This system would provide the town with approximately 24 hours of lead time before flooding occurs along the Connecticut River.

The proposed flood forecasting system is also composed of 4 precipitation and 3 stream gages, located throughout the Westfield River Basin, that would automatically respond to changes in stream levels or rainfall. This information would be transmitted to the microcomputer, which in turn would compute expected flood stages along the Westfield River. When flooding is imminent, the microcomputer would initiate visual and audible alarms. This system would provide the town with approximately 4 hours of lead time and forecasts of expected flood stages. This system provides decision makers

with timely and accurate information enabling them to take the appropriate action during a flood situation.

The proposed automated flood forecasting system would provide the town of West Springfield with timely and accurate forecasts of potential flooding along both the Connecticut and Westfield Rivers. The system was designed to be most effective for "flashy" streams with response times of 6 hours or less, such as the Westfield River. A large portion of the benefits derived from the implementation of this system are realized through timely and accurate forecasts along the Westfield River. This system would also provide forecasts for low lying areas along the Connecticut and Westfield Rivers not protected by the Riverdale and West Springfield Flood Control Projects. The town of West Springfield has shown a serious interest in this system, as demonstrated by their preparation of a flood warning and evacuation program (see Appendix 7) and their letter dated 28 September 1982 (see Appendix 3). The flood warning and evacuation program will be refined as the flood forecasting system is implemented.

During severe flooding, overtopping would first occur along the floodwall sections of the West Springfield Project. Areas located directly behind these sections of the project would be evacuated first. Other areas behind the West Springfield and Riverdale Projects would then be evacuated as the slow response time and large discharge capacity of the Connecticut River is sufficient to totally inundate these areas.

During an SPF event, overtopping would occur along the entire length of both the West Springfield and Riverdale Projects. The extent of flooding is shown in Figure 5 of the main report.

#### ECONOMICS

The total first cost of the selected plan would equal the sum of wall modifications and the flood forecasting system. The estimated annual

Wall Modifications	\$215,000
Flood Forecast System	55,000
TOTAL FIRST COST	<u>\$270,000</u>

costs of the recommended plan are shown in Table 1.

TABLE 1

#### ESTIMATED ANNUAL COSTS OF RECOMMENDED PLAN

##### Wall Modifications

Amortization 100 yr. life at 7-5/8 percent interest      \$16,400

Flood Forecast System

Amortization 100 yr. life at 7-5/8 percent interest (replace every 10 years)	\$ 8,000
Operation and Maintenance	<u>1,400</u>
TOTAL ANNUAL COST	\$25,800

Benefits accrued from implementation of the recommended plan are shown in Table 2.

TABLE 2

ANNUAL BENEFITS OF RECOMMENDED PLAN

Wall Modifications	\$ 99,000
Flood Forecast System	<u>21,000</u>
TOTAL ANNUAL BENEFITS	\$120,000

Recommended Plan

(October 1981 Price Levels)

<u>Total First Cost</u>	<u>Annual Cost</u>	<u>Annual Benefits</u>	<u>Net Benefits</u>	<u>B/C Ratio</u>
\$270,000	\$25,800	\$120,000	\$94,200	4.7 to 1

## RECOMMENDATION

I recommend that the following elements of the plan selected herein for local flood protection be authorized as a Federal project:

(1) The existing West Springfield Flood Control Project in West Springfield, Massachusetts authorized by the Flood Control Act of 1938, be modified to provide additional flood protection,

(2) An automated flood forecasting system be installed in the town of West Springfield;

with such further modifications thereto as in the discretion of the Chief of Engineers may be advisable; at a first cost presently estimated at \$270,000, with annual operation, maintenance and replacement costs presently estimated at \$1,400.

The exact amount of non-Federal contributions shall be determined by the Chief of Engineers prior to project implementation, in accordance with the following requirements to which non-Federal interests must agree prior to implementation:

A. Provide without cost to the United States all lands, easements and rights-of-way necessary for project construction.


B. Hold and save the United States free from damages due to the construction, operation, and maintenance of the project except where such damages are due to the fault of the United States or its contractors.

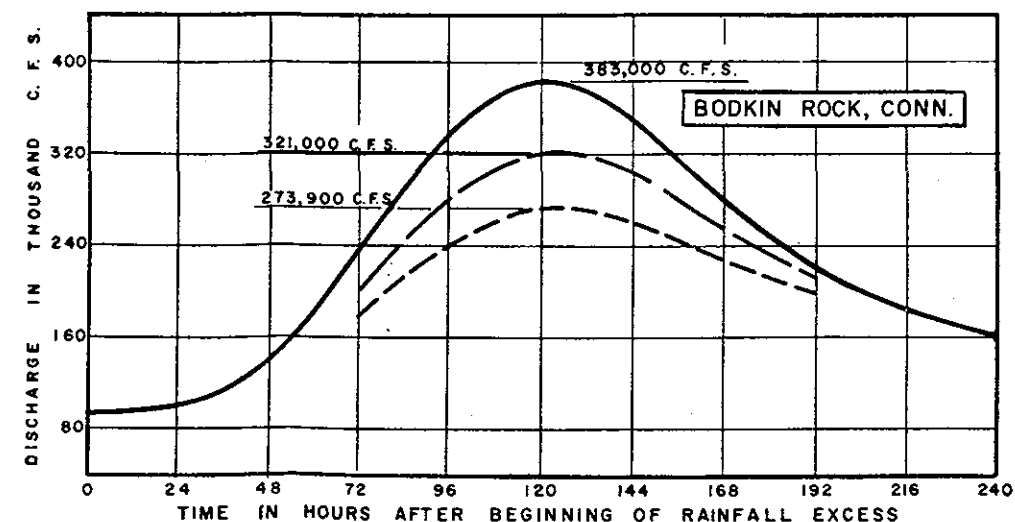
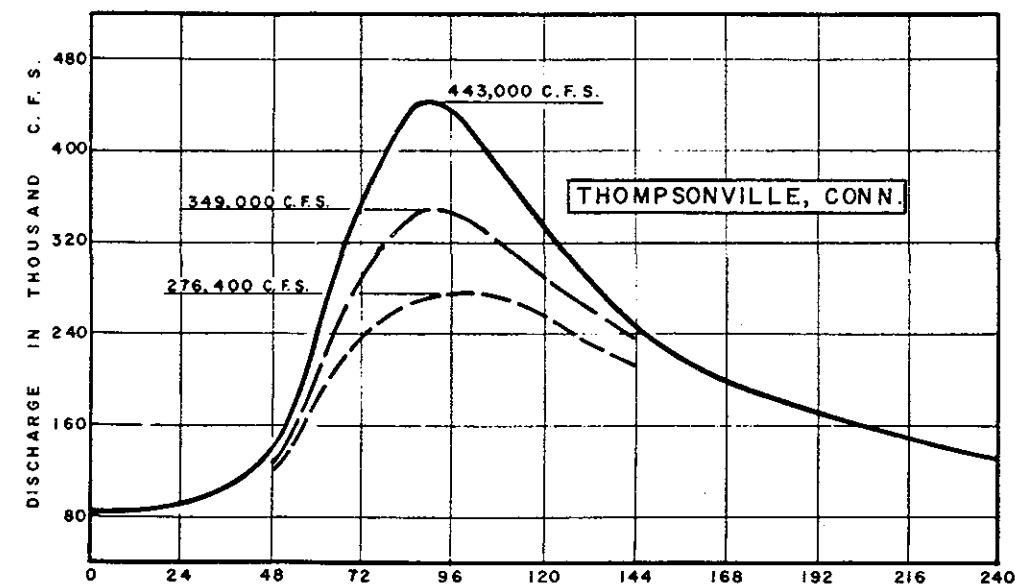
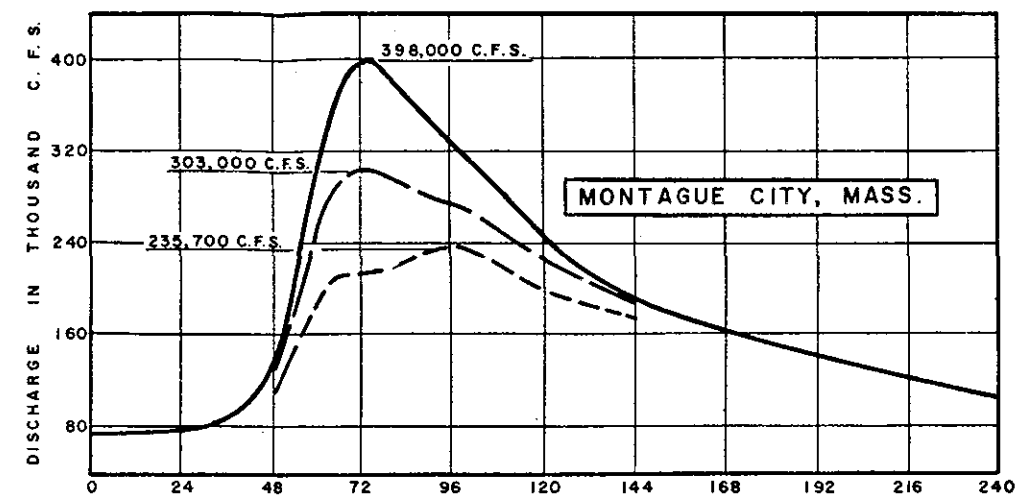
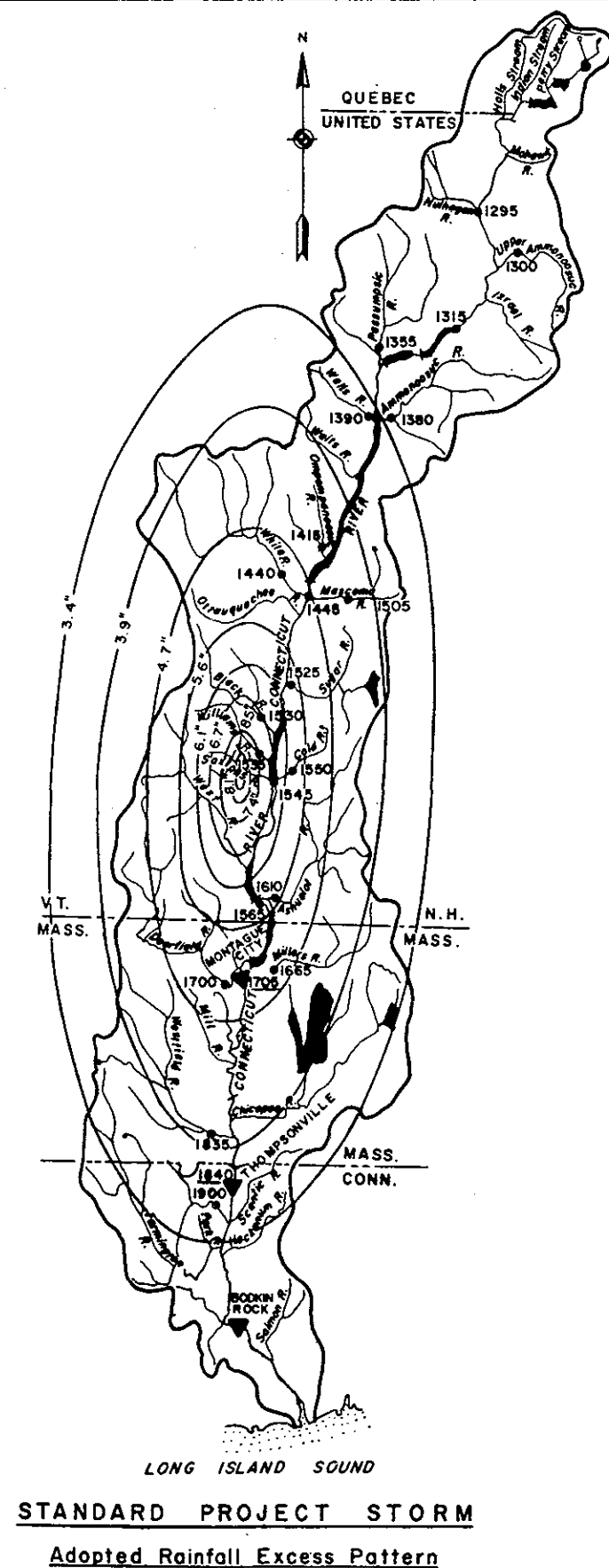
C. Maintain and operate the project after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army. Annual operation and maintenance costs are currently estimated at \$1,400.

D. Assume full responsibility for all project costs in excess of the Federal cost limitation of \$4 million. The Federal cost limitation includes preauthorization costs and all engineering, supervision, inspection, and administration costs involved in development and construction.

E. Insure an adequate evacuation plan through public education, testing and updating as required.

24 September 1982  
DATE

  
ARTHUR N. RAPPAPORT  
Lt. Colonel, Corps of Engineers  
Acting Division Engineer



#### LEGEND

- Developed Standard Project Flood.
- - - Modified by 16 existing reservoirs.
- · · Modified by 16 existing reservoirs plus 7 proposed reservoirs.

#### NOTES:

1. The Standard Project Flood was developed primarily as a lower basin flood.
2. The adopted S. P. F. includes S. P. S. runoff and snowmelt.

COMPREHENSIVE WATER AND RELATED LAND  
RESOURCES INVESTIGATION  
**CONNECTICUT RIVER BASIN  
STANDARD PROJECT FLOOD  
ADOPTED RAINFALL  
EXCESS PATTERN AND  
HYDROGRAPHS AT SELECTED STATIONS**  
DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORP OF ENGINEERS  
WALTHAM, MASS.  
JUNE 1970

